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**TECHNICAL
PUBLICATION**

SUPPLEMENTARY TEST AND EVALUATION REPORT

**[REDACTED] 7X FILAR EYEPIECE SET
FOR THE ZOOM 240R STEREOSCOPE SYSTEM**

DECLASS REVIEW BY NIMA / DoD

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**NPIC/R-20/72
JUNE 1972**

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SUPPLEMENTARY TEST AND EVALUATION REPORT

This is a supplement to Technical
Publication NPIC/R-51/71, titled

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 7X FILAR EYEPIECE SET
FOR THE ZOOM 240R STEREOSCOPE SYSTEM

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SUPPLEMENTARY TEST AND EVALUATION REPORT

7X FILAR EYEPIECE SET FOR THE ZOOM 240R STEREOSCOPE SYSTEM

1. INTRODUCTION

This is a supplement to Technical Publication NPIC/R-51/71. The Filar Eyepiece set is intended to be used on Zoom 240 Stereoscope systems. Its purpose is to make linear measurements on the film image. To do this a holding mechanism must be provided to keep the Filar Eyepiece from rotating with respect to the film image. The design of the Zoom 240 Stereoscope system, of course, affects the design of such holding mechanism.

Evolution of the Zoom 240 Stereoscope system began with the addition of stereo rhomboid arms to an ordinary Zoom 240 Microscope pod. The selection of a stereo rhomboid attachment that did not provide for image rotation led to modification of the Zoom 240 Microscope pod. The modification consisted of installing an image rotating pechan prism in each eyepiece tube. These pods were designated Zoom 240R. Because the Filar Eyepiece extends (physically) further into the eyepiece tube and interferes with the pechan prism, it could not be used with that Zoom 240R. A modified Zoom 240R was produced with smaller pechan prisms. The Filar Eyepiece was originally tested and evaluated on the modified Zoom 240R (see Technical Publication NPIC/R-51/71). The only serious deficiency that it had at that time was the inadequacy of its holding mechanism. Since then a Zoom 240R was additionally modified by adding an image rotation lock to each eyepiece tube and an interpupillary spacing lock.

redesigned the holding mechanism of the Filar Eyepiece to fit this specially modified Zoom 240R. The redesigned Filar Eyepiece cannot be installed or used on any other image rotation version of the Zoom 240, available at the time of testing. Retesting of the New Filar Eyepiece was completed on 28 April 1972.

2. RESULTS

25X1 The physical configuration of the Filar Eyepiece set is now more than satisfactory when mounted on the Zoom 240R with [redacted]. However, the minimum interpupillary distance no longer meets the contractual requirement (see Section 3. DISCUSSION). It is now 61.3mm instead of 60mm due to the interference between the eyepiece tubes and the cover of this particular Zoom 240R.

3. DISCUSSION

The Filar Eyepiece set must be properly installed on a Zoom 240 Microscope pod when the interpupillary distances are measured for comparison with the contractual requirements. On page 5 of Technical Publication NPIC/R-51/71 under the heading DESIGN OBJECTIVES - SPECIFICATIONS it states, "Minimum of 60mm with the measuring scale along the 'X' or 'Y' axis. At about 30° it should be 66.5mm." It should be noted that Zoom 240 Microscope pods (with or without image rotation) have convergent optical axes. This means that, for a given eyepiece tube separation, the interpupillary distance will vary with the height of the exit pupil above the shoulders of the eyepiece tubes.

A quick check of on-axis optical resolution and for on-axis astigmatism showed no change from the previous tests. Mechanical operation of the Filar Eyepiece is the same as before.

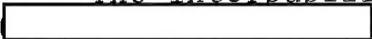
25X1 Undesirable rotation of the Filar Eyepiece about its optical axis could be caused two ways. When the operator uses the concentric focusing ring frictional drag transfers some torque to the body of the eyepiece. When the operator is gripping the end of the micrometer drum to turn it he will inadvertently apply some force at 90° to its mechanical axis which will usually produce a component of torque about the optical axis of the eyepiece. [redacted] document, DK-655, "Human Factors Review of [redacted] 7X Wide Field Filar Eyepiece" states that for T&E the torque applied to the end of the micrometer drum should be twice the torque required to focus the eyepiece. It also stated that the average maximum torque that an operator can apply to a 1/2 inch diameter knob is 42 inch-ounces. The clamping knob is 1/2 inch in diameter.

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The interpupillary spacing lock on the Zoom 240R
 does solve the inherent problem of differential rotation of the film image and the filar eye-piece reticle with interpupillary spacing changes. This is done by the simple expedient of preventing interpupillary spacing changes during a measurement.

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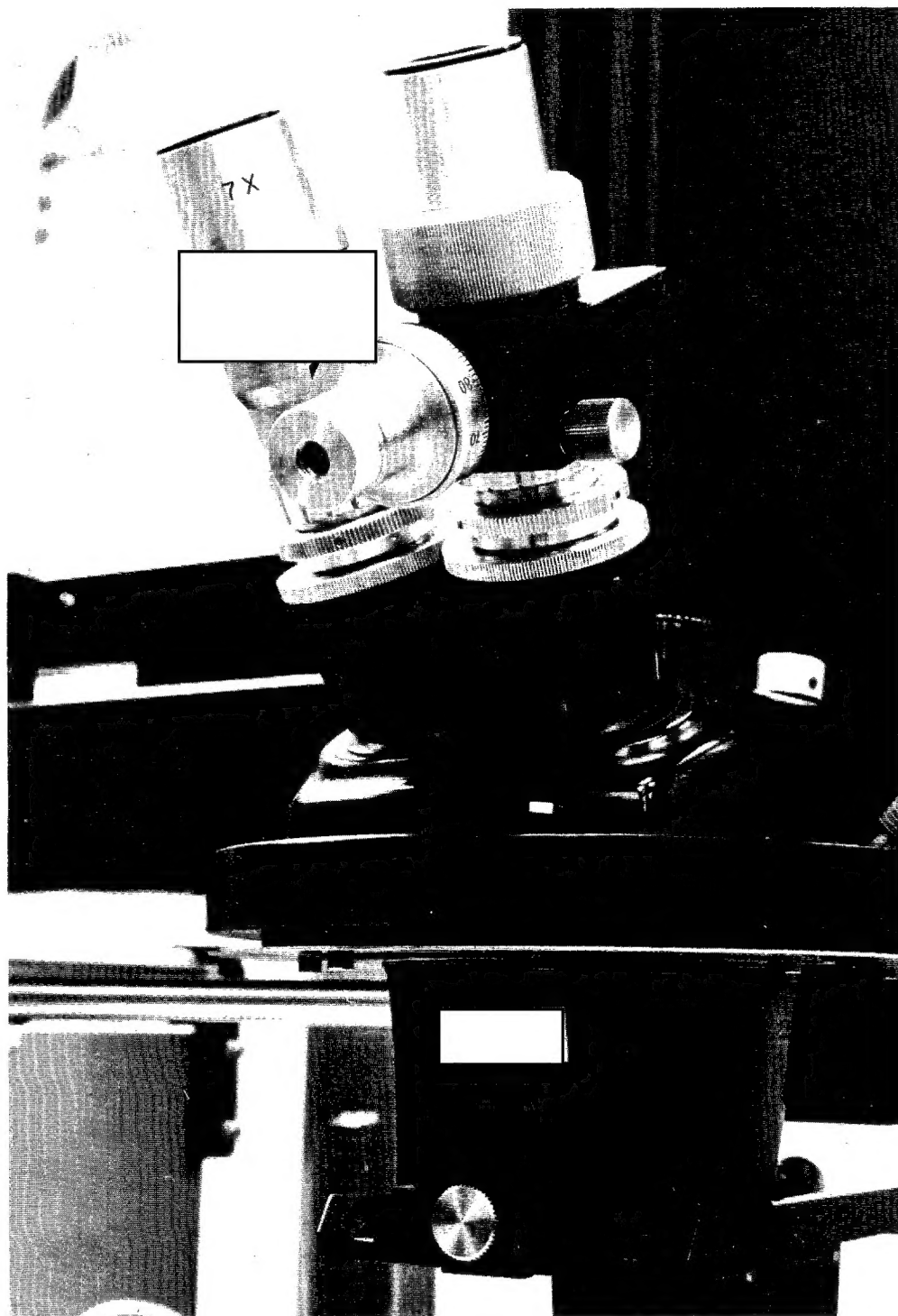


FIGURE 1. FILAR EYEPIECE SET INSTALLED ON A SPECIALLY MODIFIED ZOOM 240R.

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